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## DETAILED ACTION

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. William Schmidt on 3/3/09.

The application has been amended as follows:

Please replace **claims 11-22** with the following:

11. (Currently Amended) A heat resistant  $V_1$ ATPase, which is a  $V_1$  portion of a  $V_0V_1$ -ATPase derived from the thermophile bacteria, *Thermus thermophilus*, and is a complex molecule having three A subunits, three B subunits and one D subunit, wherein:

the A and B subunits are arranged alternately to form a hexamer cylinder, and the D subunit is embedded in the central cavity of the cylinder,

each A subunit has the amino acid sequence of SEQ ID NO: 3,

each B subunit has the amino acid sequence of SEQ ID NO: 4 and the D subunit has the amino acid sequence of SEQ ID NO: 5,

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wherein, the A subunits have two substitutions: an Ala residue for the 232<sup>nd</sup> Ser residue and Ser residue for the 235<sup>th</sup> Thr residue in SEQ ID NO:3;

wherein, optionally the D subunit further comprises a joint material, and

wherein, the joint material is optionally bound to at least one Cys residue substituted for the 48<sup>th</sup> Glu residue and Cys residue substituted for the 55<sup>th</sup> Gln residue in SEQ ID NO: 5.

12. (Currently Amended) The V<sub>1</sub>-ATPase of claim 11, wherein at least one of the A subunit and the B subunit thereof is fixed on a substrate.

13. (Currently Amended) The V<sub>1</sub>-ATPase of claim 12, which is fixed on the substrate via a His tag bound to the N terminal of the A subunit.

14. (Currently Amended) The V<sub>1</sub>-ATPase of claim 11, wherein the D subunit further comprises a joint material.

15. (Currently Amended) The V<sub>1</sub>-ATPase of claim 12, wherein the D subunit further comprises a joint material.

16. (Currently Amended) The V<sub>1</sub>-ATPase of claim 13, wherein the D subunit further comprises a joint material.

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17. (Currently Amended) The  $V_1$ -ATPase of claim 14, wherein the joint is bound to at least one of Cys residue substituted for the 48<sup>th</sup> Glu residue and Cys residue substituted for the 55<sup>th</sup> Gln residue in SEQ ID NO: 5.

18. (Currently Amended) The  $V_1$ -ATPase of claim 15, wherein the joint is bound to at least one of Cys residue substituted for the 48<sup>th</sup> Glu residue and Cys residue substituted for the 55<sup>th</sup> Gln residue in SEQ ID NO: 5.

19. (Currently Amended) The  $V_1$ -ATPase of claim 16, wherein the joint is bound to at least one of Cys residue substituted for the 48<sup>th</sup> Glu residue and Cys residue substituted for the 55<sup>th</sup> Gln residue in SEQ ID NO: 5.

20. (Currently Amended) The  $V_1$ -ATPase of claim 17, wherein all Cys residues in the A subunit and the B subunit are replaced by non-Cys residues.

21. (Currently Amended) The  $V_1$ -ATPase of claim 18, wherein all Cys residues in the A subunit and the B subunit are replaced by non-Cys residues.

22. (Currently Amended) The  $V_1$ -ATPase of claim 19, wherein all Cys residues in the A subunit and the B subunit are replaced by non-Cys residues.

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***Reasons for allowance***

The following is an examiner's statement of reasons for allowance:

The closest prior art, Soong, 2000, Science, 290, 1555-1558 teaches the F<sub>1</sub>-ATPase as a biomolecular motor. Soong discloses that genetic modification of the F<sub>1</sub>-ATPase sequence and structure has been used to precisely position individual F<sub>1</sub>-ATPase molecules on engineered nanofabricated substrates (page 1555, column 3). However, the prior art does not teach or suggest, alone or in combination, the instantly claimed mutations in subunit A as recited in the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Satyanarayana R. Gudibande whose telephone number is 571-272-8146. The examiner can normally be reached on M-F 8-4.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cecilia Tsang can be reached on 571-272-0562. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Satyanarayana R Gudibande/  
Examiner, Art Unit 1654

/Andrew D Kosar/  
Primary Examiner, Art Unit 1654